

ENGINEERING STANDARDS AND DESIGN CRITERIA

Latest Update: June 1, 2006

PART I - GENERAL ENGINEERING PLAN REQUIREMENTS

The following criteria has been established by the City of Fremont to guide Consulting (Design) Engineers in preparing and processing maps, plans, studies, reports processing and documents for subdivisions and developments, and shall apply to both public and private improvements. Conformance to these Standards is required, and these criteria should be considered as minimum requirements.

The following City ordinances and regulations apply:

Fremont Municipal Code, Title VIII, Chapter 1, Subdivisions

Fremont Municipal Code, Title VIII, Chapter 2, Zoning

Fremont Municipal Code, Title VIII, Chapter 3, Street Right-of-Way and Improvement Ordinance

Fremont Municipal Code, Title VIII, Chapter 4, Grading, Erosion and Sediment Control

Fremont Municipal Code, Title VIII, Chapter 8, Flood Damage Prevention

Fremont Municipal Code, Title VIII, Chapter 11, Storm Water Management and Discharge Control

Fremont Development Policies, revised March 2002

Fremont Standard Details, March 1994 (amended)

Fremont Standard Specifications, January 1995 (amended)

Landscape Development Requirements & Policies, March 2002

These criteria should be considered as minimum requirements. Any deviations from these design criteria, and the reasons for these deviations, shall be requested in writing prior to the plans being submitted.

Copies of Fremont Municipal Code, Ordinances and Codes can be purchased at the Development and Environmental Services Department, and is available online at www.fremont.gov.

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A. Preliminary Investigation

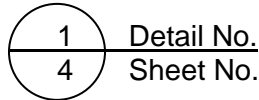
1. Upon request from the Consulting Engineer, the Engineering Division will furnish the Consulting Engineer with prints of base maps showing existing water and sanitary sewer lines, "As-Built" plans of adjoining streets (if available), bench mark locations, monument locations, and these Design Criteria. The locations and elevations of existing utilities shall be verified in the field by the Consulting Engineer and shall be shown on the plans.
2. If there are facilities in the street whose depth and/or location cannot be determined without excavation, and if the knowledge of those depths and locations are critical to the design, the Design Engineer shall engage a private contractor, obtain permits, and make necessary investigations.
3. Submittals are made only after a Registered Civil Engineer has completed and signed the plans. Submittals shall include a cover letter, along with the plans and the design calculations for review and approval by the City Engineer. Incomplete plans will be returned without being reviewed. See the required submittal list for Final Maps, Parcel Maps and Street Improvement Plans.
4. The design engineer shall also obtain information on utilities from Alameda County Water District, Union Sanitary District, PG&E, SBC, Comcast Cable, and any other known public utility company or privately owned telecom company.

B. Improvement Plans

1. All plans shall be on D-size 24" x 36" or 22" x 34" (when half-size sets are likely to be utilized) sheets of good quality mylar with a one-and-a-half (1-1/2) inch margin on the left side and a one-half inch margin on the top, bottom and right side. Plan and profile paper shall be used for the sheets containing water, sanitary sewer facilities, and storm drains.
2. Plans shall be in ink. At the discretion of the Engineering Division plans may be rejected for poor quality.
3. The scale for improvement plans shall be 1" = 20' for the horizontal, and 1" = 2' for the vertical for slopes up to 5%; 1" = 4' vertical scale may be used for slopes greater than 5%. Larger scales may be used (i.e., 1" = 10") only if required to show more detailed information, and then on a limited area.
4. All lettering shall be a minimum height of 0.1".
5. No shading will be allowed.
6. All plans must show the following information, and for multiple sheets of plans, the drawings shall have a cover sheet. That cover sheet shall contain the following items:
 - a. Location map and vicinity map with north arrow.
 - b. Typical Street Sections, including Design "R" Value and Traffic Index with type of curb and sidewalk for each street.
 - c. Project bench mark and its location referenced to City Datum.
 - d. Title block indicating name of project, name of consultant, scale and date.
 - e. Approval revision blocks to be signed by City of Fremont.
 - f. General Notes, Legend, Abbreviations
 - g. A list of City of Fremont Standard Details Referred to in the Improvement Plans.
 - h. A composite map showing an overview of the project. Utilities should be shown on the composite maps, but need not be dimensioned.

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- i. Sheet Index.
 - j. Certifications by Soils Engineer and Civil Engineer
 - k. Design Engineer's signature and stamp (including date of expiration).
 - l. Design Engineer's business name and address.
7. Details shall be put on a separate sheet and cross-referenced on the appropriate plan sheet:



References to City Standard Detail drawings shall be by appropriate drawing number.

8. Drawing number. The following information shall be shown on the plans:
- a. Design Data:
 - 1. North Arrow, Graphic Scale typical; Scale
 - 2. Right-of-Way and Easement lines and labels
 - 3. Lot Lines
 - 4. Boring Locations
 - 5. Structures
 - 6. Street Names
 - 7. Size, Material and Length of Each Run of Pipe
 - 8. Match Lines
 - 9. Limit of Work & Conforms
 - 10. Coordinate Values on Control Line Monuments Where Available
 - 11. Trees 4" in Diameter and above (existing & proposed)
 - b. Existing topographic information, including property up to at least 50 feet beyond the project boundary of the property; or as required on adjoining streets to establish existing drainage patterns.
 - c. Plan and profiles of proposed public and private streets and utilities.
 - d. Grading, including both existing and proposed contours, and supplemental cross sections as required.
 - e. Traffic signage and striping (signal and signal interconnect, as needed)
9. Profile Items Shown When Applicable.
- a. Conventional street cross-sections shall include three-line street profiles: top(s) of curb, centerline and original ground line. Raised median will have top of median curbs in addition to the normal three-line profile. Irregular street sections may use other profiles as required by the City Engineer.
 - b. One line profiles (centerline) will be accepted if the following note is added. "Top of curb elevations are (dimension) feet (above/below) the centerline elevations." Where this standard crown or curb height cannot be maintained, the curb profiles are required.
 - c. Curb return profiles.
 - d. Vertical curb lengths.

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- e. Curb inlet size, type, station, offset, invert in/out.
 - f. For cul-de-sacs, top of curb profiles.
 - g. The size, material, and slope on each run of pipe.
 - h. Existing improvement profiles being joined.
 - i. Show all existing driveways, structures, pipelines, etc., which affect the profile.
 - j. For storm drains in Pacific Commons, show the hydraulic grade line elevations at each structure for the 10/15-year and 100-year events.
10. Where a partial street is being constructed to widen an existing street, provide working cross sections at 50-foot intervals up to 100 feet past the conforms, more frequently as required to show the conforms with existing pavement.
 11. All proposed improvements shall be located on the drawings by one of the following methods:
 - a. Stationing and offset
 - b. Dimensions

Whichever of the methods is chosen, the basis of the method must be clear and referenced to some existing feature, which will remain.

12. Record As-Built drawings and an electronic submittal will be required prior to acceptance of any improvements. The following statement will need to appear on ALL sheets:

RECORD DRAWINGS

CHANGES NOTED HEREON WERE PREPARED FROM THE RECORDS OF THE CONTRACTOR AND OF THE ENGINEER AND REPRESENT REVISIONS TO THE APPROVED PLANS MADE BY THE ENGINEER AND/OR CHANGES MADE DURING CONSTRUCTION OF WHICH THE ENGINEER HAS KNOWLEDGE.

NAME	RCE#	EXP. DATE	DATE
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C. Specifications

Fremont Standard Specifications and Standard Details are available, at a cost, from the Engineering Division.

D. Joint Trench

1. New electrical distribution system, gas, telephone and Cable T.V. facilities shall be placed underground according to the standards of the utility companies.
2. The alignment of these installations shall be approved by the Engineering Division, and shown on the improvement plans.
3. All utility boxes shall be shown to scale and stationed. All joint trench sweeps to be shown as well.

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4. Show typical joint trench sections. The joint trench shall typically be installed beneath the sidewalk, with the necessary vaults and pullboxes installed in the landscape area between the sidewalk and curb and gutter.
5. Cover to finish grade shall be 36" for local streets, 42" for thoroughfares.
6. All street trees shall also be shown on the joint trench plans.
7. Joint trench plans are required to be approved by PG&E prior to approval by the City of Fremont.

E. Street Trees - Landscaping and Irrigation

1. All Landscaping and Irrigation shall conform to the Landscape Development Requirements & Policies available in the Engineering Division.
2. All street trees shall be stationed.
3. Street trees, landscaping and irrigation shall be designed and constructed to the satisfaction of the Public Works Services Department and the Engineering Division. The landscaping includes the common areas and the frontage along the public streets adjacent to the development or subdivision.
4. For common area landscaping, soil samples shall be taken off the existing on-site soil, or the imported material, and recommendations shall be submitted for soil amendments.

PART II – SOILS AND GRADING CRITERIA

A. Soils and Foundation Report

Unless waived by the City Engineer, a soils report shall be prepared by a registered Professional Engineer, which shall include the results of an investigation of the following, based upon adequate test borings.

1. A structural foundation investigation and recommendation for all proposed facilities.
2. Report on investigation and recommendation for excavation and grading.
3. Report on investigation and recommendations for trench backfill for all soils encountered in the work to assure proper compaction.
4. Soil test on "R" values of soil for determining street sections.
5. Recommendations for landscaping to maintain adequate slopes for proper drainage and erosion control.

B. Final Soils Report

1. At the completion of a project, the soils engineer shall submit a "Final Report" to the Engineering Division.
2. The Final Report shall include a map showing the locations of all compaction tests, a summary of all compaction tests performed, a certification that the work was substantially completed in accordance with the plans and specifications, comments on any unusual or problem situations which occurred during construction.

C. Grading Plans, General

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1. The developer's geotechnical engineer shall review the grading plans prior to City approval and certify that the plans are in compliance with his recommendations.
2. Grading shall generally conform to the requirements of Chapter 4, Fremont Municipal Code. The following general grading requirements shall govern:
 - a. Continuous soils inspection shall be provided by the developer's geotechnical engineer during the grading operation. Compaction reports shall be submitted and approval obtained prior to start of the next phase of the work. Reports shall be signed by a registered Professional Engineer.
 - b. The developer shall submit the compaction test results for review by the City Engineer.

D. Rough Grading Plans

1. Rough grading plans shall be of adequate scale to show all the site information on one sheet.
2. Information to be shown on the rough grading plan shall include, but is not limited to:
 - a. Pad elevation for each building;
 - b. Rough grade at each property corner and at the front yard slope;
 - c. Street grade at each property line;
 - d. Rough street section at subgrade elevation;
 - e. Site drainage pattern and inlet structures;
 - f. Existing and proposed contours;
 - g. Areas of cut and fills, and
 - h. Earthwork quantities, for a balanced site.

E. Retaining Walls

1. All retaining walls greater than 3 feet in height, as measured from the bottom of the footing to top of the wall, and walls supporting surcharge or supporting sloping backfill, shall be designed by a registered professional engineer, and supporting calculations shall be submitted along with the improvement plans.
2. Walls shall be designed in accordance with Section 2308 of the Uniform Building Code, or more restrictive criteria as recommended by the project soils engineer.
3. Walls supporting traffic loads within a horizontal distance equal to their height shall be designed with a two-foot earth surcharge.
4. Retaining walls which fall within this category shall be constructed of reinforced concrete or reinforced cement masonry.
5. Walls less than four (4) feet in height may be built out of pressure-treated timber, provided that the material shall be stamped or tagged with the appropriate seal from the American Wood Preservative Board (AWPP) Standard LP-22 or better.
6. Provisions shall be made for draining the water behind the wall to prevent build-up of fluid pressure.
7. Retaining walls in marine environment will require special design considerations as required by the City Engineer.

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F. Trenching and Backfill

1. Utility trenches shall be designed to provide five feet of horizontal clearance between respective facilities.
2. Where the depth of cover over any utility is less than three feet or greater than 20 feet, the Design Engineer must provide load calculations, special trench designs, or both, to justify inadequate trench depths.
3. In existing public streets the standard "Tee" trench is to be used with no trenches left open overnight; temporary paving or plating is required.
4. The utility trench must be clear of the influence line from the bottom of the footing on adjacent structures.
5. Backfill material shall be imported and must meet the requirements of the City of Fremont Standard Specifications and Standard Details.
6. Utilities shall be designed to provide 12" of vertical clearance between other utilities.

G. Storm Water Permit

1. A Storm Water Pollution Prevention Program (SWPPP) is required for all project sites. Effective March 10, 2003, the State Water Resources Control Board requires a Notice of Intent filed for projects with soil disturbance in excess of one (1) acre of land. Submit a SWPPP and a copy of the NOI for City review and approval prior to permit issuance.

PART III - STREET DESIGN CRITERIA

A. Public Streets, General

1. Caltrans Highway Design and Traffic Manuals shall be used in the design of the horizontal and vertical alignment.
2. The width of the street(s) shall be the minimum as shown in the Standard Details and according to the General and Specific Plans.
3. Accessible ramps shall be included at all intersections and curb returns. The ramps shall conform to Caltrans and City Standard Details.

B. Alignment

1. Minimum centerline radius of horizontal curvature shall be based upon the existing design speed of adjacent roadways or as determined by the City Engineer.
2. Roadway geometrics at intersections shall be designed to accommodate a standard WB-60, 60 foot turning radius to allow for emergency vehicle access.
3. Right-of-way line radii at intersections shall be a minimum of 10 feet, and face of curb radii shall be a minimum of 20 feet.

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4. Where the angle of intersection is acute, or where a sight-distance problem may be anticipated, an increased property line radius may be required by the City Engineer.
5. The angle between centerlines of intersecting streets shall be as nearly right angles as possible, but in no case less than 80 degrees or greater than 100 degrees, except as approved by the City Engineer.
6. All streets entering upon any given street shall have their centerlines directly opposite each other or separated by preferably 300 feet, 200 feet minimum.

C. Gradients

1. Minimum longitudinal grade on any street, public or private, shall be 0.3% for curb and gutter, with a minimum slope of 0.5% along curb returns.
2. Typical cross slopes shall be 2%. Maximum cross slopes shall be 2.5%.
3. The maximum grade on any street shall be as follows:
 - a. Arterials: 6%
 - b. Collector streets: 12%
 - c. Residential streets and hillside streets: 15%
4. Super-elevation may be provided on streets where required by the City Engineer. Use Caltrans Highway Design Manual for design of super-elevation.
5. Grades on both sides of the street shall be the same.
6. Vertical curves shall be as follows:
 - a. Residential and industrial streets shall be designed to provide a minimum stopping sight-distance corresponding to a design speed equal to the prima facia residential speed limit plus five miles per hour.
 - b. Major streets and collector roads shall be designed to accommodate vehicle speeds of 50 miles per hour or more.
 - c. Vertical curves shall be used when the algebraic change in grade exceeds 1% and shall have a minimum length of 50 feet.
7. The maximum grade for a permanent cul-de-sac street turning area shall be 5%.
8. The maximum grade at any intersection of two streets shall be 10% within the intersection and for at least 50 feet from the curb return.
9. When any road is extended to a subdivision boundary for the purpose of providing a future connection to adjoining property, the subdivider shall submit an alignment and profile demonstrating the feasibility of such future extension.

D. Pavement, Structural Sections

1. All design shall conform to City policies, using the R-value of the native soil from Part II – Soils and Grading Criteria, and the minimum traffic indices T.I. as follows:
 - a. For all cul-de-sacs a minimum T.I. of 5.5.
 - b. For all residential streets a minimum T.I. of 5.5.
 - c. All others, use the Traffic Index as determined by the City Engineer, based upon the projected volume of traffic.
 - d. All pavement sections shall be designed for a **30-year** pavement life.

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2. Road surfacing on all classes of residential streets shall be asphaltic concrete, unless otherwise required and approved.

E. Speed Humps

Speed humps may only be installed where approved by the City's Traffic Engineer, where an engineering study concludes that the use of such control device is warranted.

1. Dimensions, spacing, location, traffic control and installation shall conform to the City's Standard Details.

PART IV - DRIVEWAYS AND OFF-STREET PARKING AND LOADING FACILITIES

A. Driveways

Driveways, which are defined as any approach to or from a street over and upon an adjacent gutter, curb or sidewalk. The following requirements are derived from Fremont Municipal Code, Title VIII, Chapter 2, Zoning and Development Policy for Driveways:

1. All driveway approaches shall conform to the City's Standard Details.
2. No driveway approach to off-street parking spaces shall be constructed which does not serve a garage, carport or garage space to the rear of the building setback line established by the Zoning Ordinance; provided, that a single driveway approach may be constructed to serve a vacant or unimproved lot.
3. For residential driveways, the maximum width is 20 feet.
4. For commercial driveways, the maximum width is 35 feet.
5. In no event shall the total width of all driveway approaches serving any parcel exceed sixty percent (60%) of the street frontage of the parcel.
6. There shall be twenty-two feet or a multiple thereof between driveway approaches on the same parcel; provided, that the City Engineer may approve a distance between driveway approaches which is not a multiple of twenty-two feet if he finds that the total number of parking spaces available on the street adjacent to the parcel is not reduced by allowing such other distance.
7. No driveway approach shall be located within five feet (5') of any traffic signal, electroliner, fire hydrant, pedestrian crosswalk, curb inlet, or any other public improvement or facility of a similar nature.
8. All driveway approaches, whether on an improved or an unimproved street, shall be constructed to the established grade for that street at the right-of-way line. In the event no grade has been established for the street on which the driveway or driveway approach is to be constructed, such driveway or driveway approach shall be constructed to a grade at the right-of-way to be approved by the City Engineer.
9. Driveway ramps up or down to elevated or depressed parking lots or garages shall start at a point 3 feet beyond the right-of-way line, and shall have a grade no steeper than 20%, with a 6 feet long vertical curve located at the grade break (See Attachment "D-3").
10. Cold joints in load bearing concrete shall be made with dowels and expansion joint material.

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PART IV – STORM DRAIN DESIGN CRITERIA

- A. Storm Drain: Storm drainage facilities shall be designed in accordance with §8-4134 of the Fremont Municipal Code and the Hydrology and Hydraulics Criteria Summary for Western Alameda County.

Note: Minimum size for storm drainage mains are 15" RCP. Minimum size for storm drainage laterals are 12" RCP.

- B. Storm drain systems maintained by Alameda County Flood Control (ACFC) require a separate encroachment permit.

C. Alignment

1. Storm drainage alignment shall be manhole to manhole (some exceptions may be made with inlet to inlet runs on a case by case basis).
2. Conduits 24 inches or less in diameter should be laid on straight alignment and uniform grade between consecutive manholes.
3. Horizontal and vertical curves are not recommended. However, in cases where justification can be shown, limited use of such designs will be considered. A design report or letter report will be required from the design engineer to document the justifications for utilizing a curved alignment.
4. Radii of curvature must be of sufficient length to limit deflections to 1/2 the manufacturer's recommended allowable deflection. Complete and accurate details shall be furnished, including: the exact location of such curved pipes, length of curve, radius of curvature, and stationing of curve points.
5. Where curved alignments are utilized, the City may require the following:
 - a. Slope greater than minimum slope for the size of pipe.
 - b. Manhole spacing of less than 300 feet.
 - c. Provide a licensed professional land surveyor or engineer to continuously monitor installation of the curved pipe during construction.
 - d. Video inspection of curved pipes prior to final acceptance.
5. Following are common locations for manholes/drainage structures:
 - a. Where two or more conduits join,
 - b. At intermediate points on long pipe runs, maximum spacing of 300 feet,
 - c. Where the conduit changes in size,
 - d. At sharp curves or angle points in excess of 10 degrees, and
 - e. Points where an abrupt change of the grade occurs.
 - f. Where pipe material changes (example: RCP to PVC)
6. Minimum horizontal clearance to other utilities shall be five feet.
7. Minimum vertical clearance from other utilities shall be one foot.
8. Minimum cover from top of pipe to finished grade shall be three feet.
9. The maximum angle from in-going pipe to outgoing pipe shall be 90 degrees.

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10. Minimum horizontal clearance from any structure shall be based on the criteria of keeping the bottom of the trench clear of the "1 to 1" plane from the bottom of the structural footing.

D. Materials

1. Materials shall be Reinforced Concrete pipe for pipes 12" in diameter and larger. Minimum "D" Load values for RCP shall be 1350.
2. Trench load calculations shall be provided where depth of cover is less than three feet and greater than 20 feet.
3. All storm drain structures shall be cast in place.

E. Storm Drain Design

1. All concentrated run-off shall be carried in a concrete drainage device.
2. Minimum velocity is 2 fps for the design flow. Submit separate calculations when backwater condition occurs and velocity is less than minimum.
3. All downspouts from buildings shall be shown and not connected directly to the storm drain system, but discharged into landscape areas. In no case shall the downspouts be permitted to discharge over a walkway or a sidewalk.
4. Water from valley and drainage gutters shall be intercepted by an appropriately sized drainage structure and piped to the nearest storm drain in the street.
5. Thru-curb drains are not allowed.

F. Maintenance Requirements

1. The City maintains most storm drains in public streets.
2. Alameda County maintains most channels.

Private developments must maintain their own storm drains and their private storm drains up to the nearest point of connection in the public street.

All new storm drain systems shall be televised. See City Standard Notes.

PART VI – WATER FACILITIES

Alameda County Water District (510-659-1970) is responsible for the water distribution system, however, work in the City of Fremont right of way requires an Encroachment Permit.

1. Fire Hydrants

Fire hydrants shall be spaced every 300 feet, as approved by the Fire Marshall.

2. Domestic and Fire Service Facilities

No above ground fire equipment (fire department connections, post-indicator valves, backflow preventers) shall be installed in the City right of way. Below grade

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water facilities in the right of way are acceptable, subject to review and approval by the City Engineer.

PART VII – SANITARY SEWER FACILITIES

Union Sanitary District (510-477-7630) is responsible for the sanitary sewer system, however, work in the City of Fremont right of way requires an Encroachment Permit.

PART VIII – STREET LIGHTS

1. Conform to City Standard Details SD-27 and show details on Plan.
2. Show Vicinity Map, Legend, conduit Size and number of cables in conduit.
3. Show North Arrow with Graphic Scale.
4. Electrolier spacing on the average is 180 feet apart for public streets, private street light must submit a photometric design (design to minimum 0.12 foot candles). For public electroliers, label pole numbers of each pole as provided by P.G. & E. Engineer to obtain.
5. Trenches crossing public streets shall be at right angles. All 90 degree bends (street crossings) shall install a pull box with a fuse. Install pull boxes with a fuse at all service points. When crossing a major thoroughfare bore and jacking will be required.
6. Major thoroughfares use 100 watt high pressure sodium, 35 foot pole height, and 0.25 pole thickness. All other streets use 70 watts HPS, 30 foot pole height and 0.185 pole thickness.
7. Show typical trench detail(s).
8. Electrical Engineer shall stamp, sign and date the final plans.
9. Submit Utility Trench Design.

NOTES:

1. Contact Underground Service Alert (USA) at ph. (800) 227-2600 at least 48 hours prior to the start of work.
2. Utility work in the street right-of-way not installed by the contractor will require a separate permit by the agency performing such work.